

**CLAIMS:**

1. An apparatus for humidifying a process gas stream, for a fuel  
5 cell, the apparatus comprising:  
a humidification unit having an inlet for the process gas stream,  
for adding humidity to the process gas stream at a first temperature, to a  
humidity well in excess of a required humidity level;  
a first heat exchanger connected to the humidification unit, for  
10 cooling the process gas stream to a second, lower temperature, whereby  
excess moisture in the process gas stream condenses, and for removing the  
condensed moisture, whereby the process gas stream leaving the heat  
exchanger has a known temperature and a known humidity level.
- 15 2. An apparatus as claimed in claim 1, which includes a first heater  
connected to the first heat exchanger, for heating the process gas stream to a  
third temperature, greater than the second temperature, whereby the  
process gas stream has a known absolute humidity level.
- 20 3. An apparatus as claimed in claim 2, wherein the humidification  
unit includes a steam injector for injecting steam into the process gas  
stream.
4. An apparatus as claimed in claim 2, which includes an outlet line  
25 connected to the first heater and an elongate heating means provided for  
the outlet line, for maintaining the outlet line at the third temperature.
5. An apparatus as claimed in claim 4, where the elongate heating  
means comprises elongate electrical heating elements.
- 30 6. An apparatus as claimed in claim 2, which includes a separator,  
for removing the condensed moisture, provided between the first heat  
exchanger and the first heater.

7. An apparatus as claimed in claim 2, wherein the first heat exchanger includes a first temperature control circuit, for controlling the temperature of the heat exchanger, the first temperature control circuit comprising a conduit for a fluid, a pump for pumping the fluid, and means  
5 for cooling the fluid.

8. An apparatus as claimed in claim 7, wherein the first cooling circuit additionally includes a further heater for heating the fluid.

10 9. An apparatus as claimed in claim 2 or 7, wherein the first heater comprises a second heat exchanger, and wherein the second heat exchanger is provided with a second temperature control circuit for controlling the temperature of the second heat exchanger, the second temperature control circuit comprising a conduit for fluid, a pump for circulating the fluid and a  
15 third heater for heating the fluid.

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